

1. A method of forming a chemical casing while drilling through a zone or formation comprising drilling with a drilling fluid having a pH in the range of from about 6 to about 10 and that comprises water, a water soluble or water dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to harden when cured, a particulate curable solid thermoset resin, a water soluble or dispersible thermoset resin, and a delayed dispersible acid-catalyst for curing the solid thermoset resin and the water soluble thermoset resin, whereby the drilling fluid forms a filter cake on the walls of the zone or formation that cures into a hardened cross-linked chemical casing thereon.

2. The method of claim 1 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more of hydroxyl, amide, carboxyl and epoxy functional groups.

3. The method of claim 1 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

4. The method of claim 3 wherein the polysaccharide is selected from the group consisting of chitosan, hydroxyethylcellulose, carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

5. The method of claim 1 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

6. The method of claim 1 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

7. The method of claim 1 wherein the water soluble thermoset resin is selected from the group consisting of water soluble melamine-formaldehyde type resins, water soluble urea-formaldehyde type resins and water soluble phenol-formaldehyde type resins.

8. The method of claim 1 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

9. The method of claim 1 wherein the acid in the delayed dispersible acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid, phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

10. The method of claim 1 wherein the fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and polyvinyl butyral.

11. The method of claim 10 wherein the one or more insoluble chemical casing reinforcing materials are present in the fluid in an amount in the range of from about 2% to about 25% by weight of water in the fluid.

12. The method of claim 1 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the drilling fluid.

13. The method of claim 1 wherein the particulate curable solid thermoset resin is present in the fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

14. The method of claim 1 wherein the water soluble thermoset resin is present in the fluid in an amount in the range of from about 5% to about 80% by weight of water in the fluid.

15. The method of claim 1 wherein the acid in the delayed dispersible acid catalyst is present in the fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the fluid.

16. The method of claim 1 wherein the pH of the fluid is about 8.

17. A method of forming a chemical casing in a well bore to improve the mechanical strength thereof or to provide zonal isolation, or both, while drilling the well bore comprising drilling the well bore with a drilling fluid having a pH in the range of from about 6 to about 10 and that comprises water, a water soluble or water dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to harden when cured, a particulate curable solid thermoset resin, a water soluble or dispersible thermoset resin, and a delayed dispersible acid-catalyst for curing the solid thermoset resin and the water soluble thermoset resin, the drilling fluid forming a filter cake on the walls of the well bore that cures into a hardened cross-linked chemical casing thereon.

18. The method of claim 17 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more of hydroxyl, amide, carboxyl and epoxy functional groups.

19. The method of claim 17 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

20. The method of claim 19 wherein the polysaccharide is selected from the group consisting of chitosan, hydroxyethylcellulose, carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

21. The method of claim 17 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

22. The method of claim 17 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

23. The method of claim 17 wherein the water soluble thermoset resin is selected from the group consisting of water soluble melamine-formaldehyde type resins, water soluble urea-formaldehyde type resins and water soluble phenol-formaldehyde type resins.

24. The method of claim 17 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

25. The method of claim 17 wherein the acid in the delayed dispersible acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid, phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

26. The method of claim 17 wherein the drilling fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and polyvinyl butyral.

27. The method of claim 26 wherein the one or more insoluble chemical casing reinforcing materials are present in the drilling fluid in an amount in the range of from about 2% to about 25% by weight of water in the drilling fluid.

28. The method of claim 17 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the drilling fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the drilling fluid.

29. The method of claim 17 wherein the particulate curable solid thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

30. The method of claim 17 wherein the water soluble thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 80% by weight of water in the drilling fluid.

31. The method of claim 17 wherein the acid in the delayed dispersible acid catalyst is present in the drilling fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the drilling fluid.

32. The method of claim 17 wherein the pH of the drilling fluid is about 8.

33. A method of forming a chemical casing in a well bore to improve the mechanical strength thereof or to provide zonal isolation, or both, while drilling the well bore comprising drilling the well bore with a drilling fluid having a pH of about 8 and that comprises water, a polysaccharide polymer which is capable of being cross-linked by a thermoset resin and causing the resin to harden when cured present in the drilling fluid in an amount in the range of from about 1% to about 10% by weight of water in the drilling fluid, a particulate curable solid alkyl ether of a melamine-formaldehyde resin present in the drilling fluid in an amount in the range of from about 10% to about 30% by weight of water in the drilling fluid, a water soluble or dispersible alkyl ether of melamine-formaldehyde resin present in the drilling fluid in an amount in the range of from about 20% to about 70% by weight of water in the drilling fluid, and a dispersible delayed ammonium chloride acid catalyst for curing the particulate solid resin and the water soluble or dispersible resin present in the drilling fluid in an amount in the range of from about 1% to about 6% by weight of the resins in the drilling fluid, the drilling fluid forming a filter cake on the walls of the well bore that cures into a hardened cross-linked chemical casing thereon.

34. A chemical casing made by a process of drilling through a zone or formation with a drilling fluid having a pH in the range of from about 6 to about 10 and that comprises water, a water soluble or water dispersible polymer which is capable of being cross-linked by a thermoset resin and causing the resin to harden when cured, a particulate curable solid thermoset resin, a water soluble or dispersible thermoset resin, and a delayed dispersible acid-catalyst for curing the solid thermoset resin and the water soluble thermoset resin, wherein the drilling fluid forms a filter cake on the walls of the zone or formation that cures into a hardened cross-linked chemical casing thereon.

35. The chemical casing of claim 34 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polymers containing one or more of hydroxyl, amide, carboxyl and epoxy functional groups.

36. The chemical casing of claim 34 wherein the water soluble or dispersible polymer which is cross-linked by the thermoset resin is selected from the group consisting of polyvinylalcohol, polyvinylbutyral, polyesters, polyalkylacrylic acids, polyurethanes, acrylamide polymers, proteins, polyols and polysaccharides.

37. The chemical casing of claim 34 wherein the polysaccharide is selected from the group consisting of chitosan, hydroxyethylcellulose, carboxymethylhydroxyethylcellulose, water soluble starches, guar gum, xanthan gum, welan gum, carragenan gum and arabic gum.

38. The chemical casing of claim 34 wherein the particulate curable solid thermoset resin is selected from the group consisting of particulate solid melamine-formaldehyde type resins, particulate solid urea-formaldehyde type resins and particulate solid phenol-formaldehyde type resins.

39. The chemical casing of claim 34 wherein the particulate curable solid thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

40. The chemical casing of claim 34 wherein the water soluble thermoset resin is selected from the group consisting of water soluble melamine-formaldehyde type resins, water soluble urea-formaldehyde type resins and water soluble phenol-formaldehyde type resins.



41. The chemical casing of claim 34 wherein the water soluble or dispersible thermoset resin is selected from the group consisting of an alkyl ether of a melamine-formaldehyde resin and an alkyl ether of a urea-formaldehyde resin.

42. The chemical casing of claim 34 wherein the acid in the delayed dispersible acid catalyst is an organic or inorganic acid selected from the group consisting of p-toluene sulfonic acid, dinonylnaphthalene sulfonic acid, dodecyl benzene sulfonic acid, oxalic acid, maleic acid, hexamic acid, a copolymer of phthalic and acrylic acid, trifluoromethane sulfonic acid, phosphonic acid, sulfuric acid, hydrochloric acid, sulfamic acid and ammonium salts that produce acids when dissolved in water.

43. The chemical casing of claim 34 wherein the drilling fluid further comprises one or more insoluble chemical casing reinforcing materials selected from the group consisting of carbon fibers, glass fibers, mineral fibers, cellulose fibers, silica, zeolite, alumina, calcium sulfate hemihydrate, acrylic latexes, polyol-polyesters and polyvinyl butyral.

44. The chemical casing of claim 43 wherein the one or more insoluble chemical casing reinforcing materials are present in the drilling fluid in an amount in the range of from about 2% to about 25% by weight of water in the drilling fluid.

45. The chemical casing of claim 34 wherein the water soluble or water dispersible polymer which is cross-linked by the thermoset resin is present in the drilling fluid in an amount in the range of from about 0.5% to about 20% by weight of water in the drilling fluid.

46. The chemical casing of claim 34 wherein the particulate curable solid thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 50% by weight of water in the drilling fluid.

47. The chemical casing of claim 34 wherein the water soluble thermoset resin is present in the drilling fluid in an amount in the range of from about 5% to about 80% by weight of water in the drilling fluid.

48. The chemical casing of claim 34 wherein the acid in the delayed dispersible acid catalyst is present in the drilling fluid in an amount in the range of from about 0.5% to about 8% by weight of thermoset resin in the drilling fluid.

49. The chemical casing of claim 34 wherein the pH of the drilling fluid is about 8.

50. A chemical casing made by the process of drilling a well bore with a drilling fluid having a pH of about 8 and that comprises water, a polysaccharide polymer which is capable of being cross-linked by a thermoset resin and causing the resin to harden when cured present in the drilling fluid in an amount in the range of from about 1% to about 10% by weight of water in the drilling fluid, a particulate curable solid alkyl ether of a melamine-formaldehyde resin present in the drilling fluid in an amount in the range of from about 10% to about 30% by weight of water in the drilling fluid, a water soluble or dispersible alkyl ether of melamine-formaldehyde resin present in the drilling fluid in an amount in the range of from about 20% to about 70% by weight of water in the drilling fluid, and a dispersible delayed ammonium chloride acid catalyst for curing the particulate solid resin and the water soluble or dispersible resin present in the drilling fluid in an amount in the range of from about 1% to about 6% by weight of the resins in the drilling fluid, the drilling fluid forming a filter cake on the walls of the well bore that cures into a hardened cross-linked chemical casing thereon.